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SPECIFICATION FOR ELECTRONIC WEIGHING SYSTEMS

PART I TERMS AND DEFINITIONS

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SPECIFICATION FOR ELECTRONIC WEIGHING SYSTEMS

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SPECIFICATION FOR ELECTRONIC WEIGHING SYSTEMS

PART I TERMS AND DEFINITIONS

0. FOREWORD

0.1 This Indian Standard (Part I) was adopted by the Indian Standards Institution on 17 September 1979, after the draft finalized by the Electronic Measuring Equipment Sectional Committee had been approved by the Electronics and Telecommunication Division Council.

0.2 This Indian Standard (Part I) covers terms and definitions relating to electronic weighing system.

0.3 The specifications for electronic weighing systems are being prepared in the following four parts:

a) Terms and definitions,
b) Methods of measurements,
c) Requirements, and
d) Code of practice for installation and use.

0.4 While preparing this standard, assistance has been derived from the following:

a) Terminology on load cells, prepared by Scale Manufacturers Association, USA.
b) Recommendation No. 3 Metrological Regulations for Non-automatic Weighing Systems, issued by International Organization of Legal Metrology.

0.5 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

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*Rules for rounding off numerical values (*revised*).

1. SCOPE

1.1 This standard (Part I) covers terms and definitions related to electronic weighing systems.

2. TERMS RELATING TO LOAD CELLS

2.1 Accuracy — Deviation between measured value and true value. In practice it is expressed as a percentage of rated output.

2.2 Ambient Condition — Condition of medium surrounding the device.

NOTE — This includes humidity, atmospheric pressure, temperature, dust, radiation and vibration.

2.3 Angular Load (Concentric) — The load applied concentric to the primary axis, at the point of application and in some angle with respect to primary axis of loading.

2.4 Angular Load (Eccentric) — The load applied eccentric with primary axis at the point of application and at any angle with respect to primary axis of loading.

2.5 Axial Load — The load applied along or parallel to and concentric with primary axis of loading.

2.6 Calibration — The comparison of load cell output against standard test load weights.

2.7 Calibration Accuracy — The amount by which the actual rated output of a transducer differs from its nominal rated output, expressed in percent rated output.

2.8 Calibration Curve — The record of the output of the load cell under comparison against standard test loads.

2.9 Combined Error (Non-linearity and Hysteresis) — The maximum deviation from the straight line drawn between original no-load and the rated load outputs, expressed as a percentage of the rated output and measured on both increasing and decreasing loads.

2.10 Compensation — The utilization of supplementary devices, materials or processes to minimize known sources of error.

2.11 Creep — The change in load cell output occurring with time while under rated load and with all the environmental conditions and other variables remaining constant.

NOTE — This is measured with rated load applied and expressed as a percent of rated output over a specific period of time.

2.12 Creep Recovery — The change in no-load output occurring with time and measured over a specific period after removal of the rated load.

NOTE — This is measured over a specific period of time immediately after the removal of rated load expressed as a percent of rated output.

2.13 Cross Sensitivity — The output when a load is applied in a direction orthogonal to the primary axis expressed as percentage of rated output.

2.14 Deflection — The displacement of the point of loading of the load cell between the no-load and rated load conditions.

2.15 Drift — The random change in output under constant load and normal operating conditions.

2.16 Eccentric Load — Any load applied parallel to but not concentric with the primary axis.

2.17 Elastic Member — The element or elements within the load cell to which a number of sensing elements are attached.

2.18 Error — The algebraic difference between the indicated and the true value of the load being measured.

2.19 Excitation (Electrical) — The voltage or current applied to the input terminals of the load cell.

2.20 Excitation Electrical (Maximum) — The maximum excitation permitted, beyond which permanent degradation of electrical characteristics of the load cell is likely to take place.

2.21 Fatigue Life — Number of load cycles at a specified load before deterioration in electrical characteristics occurs.

NOTE — A load cycle shall constitute (tension and compression) loading the device to a specified load and back to zero load in the direction of loading.

2.22 Hysteresis — The maximum difference between load cell output readings for the same applied load, one reading obtained by increasing the load from zero to rated and the other by decreasing the load from rated load.

NOTE — This difference is usually taken at half rated load and expressed in percent of rated output.

2.23 Insulation Resistance — The dc resistance measured between the load cell circuits and the load cell structure.

2.24 Load — The weight or force applied to the load cell.

2.25 Load Cell — The device which produces an output signal proportional to the applied weight or force.

2.26 Loading Surface — The area of application of the load under measurement or calibration.

2.27 Natural Frequency — The frequency of free mechanical oscillations under no-load conditions.

2.28 No-Load Output — The output signal of the load cell with rated excitation and with no-load applied usually expressed as percentage of rated output.

2.29 Non-linearity — The maximum deviation of the calibration curve from a straight line drawn between the no-load and the rated load outputs, expressed as a percentage of rated output and measured on increasing load only.

2.30 Output — The signal (voltage, current, etc) produced by the load cell.

2.31 Output, Rated — The algebraic difference in value between the outputs at the no-load and rated load conditions; expressed as volts per volts or volts per ampere, etc, of excitation.

2.32 Overload Rating (Safe) — The maximum static load expressed in percentage of rated capacity which can be applied without producing a permanent shift in performance characteristics beyond those specified.

2.33 Overload Rating (Ultimate) — The maximum static load expressed in percentage of rated capacity, which can be applied without producing a structural failure.

2.34 Primary Axis — The axis along which the load cell is designed to be loaded; normally its geometric centre line.

2.35 Rated Capacity (Rated Load) — The maximum static axial load for which the load cell is designed to operate, within its specifications.

2.36 Reference Standard — A force measuring device whose characteristics are precisely known relative to a primary standard.

2.37 Repeatability — The maximum difference between the load cell output readings for repeated loadings under identical loading and environmental conditions. The value expressed as percentage of nominal output signal for that load.

2.38 Resolution — The smallest change in mechanical input which produces a detectable change in the output signal.

2.39 Response Time — Time taken by the load cell to stabilize to the corresponding output value for a step input.

2.40 Sensitivity — *See* Output, Rated (**2.31**).

2.41 Simulated Calibration — The electrical simulation of load cell output by insertion of known magnitude of electrical parameters between appropriate points within the circuitry.

2.42 Simulation to Load Correlation — The difference in output readings obtained through electrically simulated and actual applied loads.

2.43 Span — *See* Output, Rated (**2.31**).

2.44 Span Stability — The degree to which the load cell maintains its specified span with all environmental conditions and other variable remaining constant.

2.45 Temperature Effect on No-Load Output (Zero Balance) — The change in no-load output due to a change in ambient temperature, expressed as percentage of change in rated output per 10°C.

2.46 Temperature Effect on Output — The change in rated output due to a change in ambient temperature, expressed as percentage of rated output per 10°C.

2.47 Temperature Range (Compensated) — The range of temperature over which the load cell is compensated to maintain both the rated output and the no-load output within specified limits.

2.48 Temperature Range (Safe) — The extremes in temperature within which the load cell shall operate without any permanent adverse change to any of its performance characteristics.

2.49 Terminal Impedance (Excitation) — The impedance of the load cell circuit measured at the input terminals at standard temperature with no load applied and with the output signal terminals short circuited.

2.50 Terminal Impedance (Signal) — The impedance of the load cell circuit measured at the output signal terminals at standard temperature with no load applied and with the excitation terminals open circuited.

2.51 Traceability — The step by step transfer processes by which the load cell calibration can be related to the reference standards.

2.52 Zero Balance — *See* No-Load Output (**2.28**).

2.53 Zero Return — The difference in no-load outputs measured immediately before rated load application for specified duration and measured after removal of the load and when the output has stabilized.

2.54 Zero Shift — The change in no-load output.

2.55 Zero Shift (Parmanent) — Permanent change in no-load output.

2.56 Zero Stability — The degree to which the load cell maintains its no-load output with all the environmental conditions and other variables remaining constant.

3. TERMS RELATED TO ELECTRONIC WEIGHING SYSTEMS

3.1 Digital Graduation (d_d) — The value, in units of mass, of the difference between two consecutive values of indication or printing.

3.2 Digital Indication or Printing — The indication or printing whose graduation marks are generally composed of a series of aligned numbers; which do not permit interpolation to less than a graduation.

3.3 Discrimination — The value of the smallest additional load which, when placed without any impact, is necessary to change the state of equilibrium of the system.

NOTE — The term ' Resolution of System ' is also used for this property.

3.4 Load Measuring Device — That part of the system which measures the mass of the load.

3.5 Load Receptor — That part of the system which is intended to receive the load.

3.6 Maximum Capacity — The maximum weighing capacity of the weighing system.

3.7 Maximum Permissible Error — Maximum difference, in excess or deficiency permitted under the rules between weighing result and the mass of the load being weighed, the system being previously set at zero at no load.

3.8 Maximum Tare Additive Effect — The maximum capacity of the tare additive device.

3.9 Maximum Tare Subtractive Effect — The maximum capacity of the tare subtractive device.

3.10 Minimum Capacity — The value of the load below which the weighing system may have an error, beyond specified limits.

3.11 Non-automatic Weighing Systems — Weighing systems which require the intervention of the operator during the weighing process, particularly to deposit the loads on the load-receptor or to remove them and also to determine the result.

3.12 Number of Graduations (*n*) — Ratio of the maximum capacity to the digital graduation.

3.13 Printing Device — The part of the load measuring system which prints the result of weighment.

3.14 Repeatability — Ability of a system to give identical results when the same load is placed on or removed from the load receptor several times.

3.15 Rounding Error of Digital Indication or Printing — The difference between the digital indication or printing and the result the weighing system would give if the indication or printing were continuous.

3.16 Selector System — A system for connecting one or more load receptors to one or more load measuring systems.

3.17 System Accuracy — Difference between values as measured on the system and the true weight, usually expressed in percent of the rated capacity of the weighing system.

3.18 System Calibration — The comparison of system output in terms of load against standard test loads.

3.19 Tare — The amount of weight, deducted from gross weight, in ascertaining the nett weight.

3.20 Tare Additive Device — A device for balancing the tare without intruding on the weighing range of the system.

3.21 Tare Subtractive Device — A device for subtracting the tare from the weighing result, thus reducing the weighing range of the system.

3.22 Verification Graduation (*e*) — The value expressed in units of mass, used for verification purposes.

3.23 Weighing Range — The difference between the maximum and minimum capacities (*see* **3.5** and **3.6**).

3.24 Zero-Setting Device — A device for setting the weighing systems to the correct zero position.

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